

REMARKS

Claim objections

Claims 8, 9, 10, and 15 have been objected to due to the terms “(ADI),” “(CD-SEM),” and “(AEI)” potentially having several meanings. Although Applicant does not necessarily agree, Applicant has without prejudice amended these claims to remove these terms, and requests that these objections be withdrawn.

Claim rejections under 35 USC 112

Claims 6, 7, and 14 have been rejected under 35 USC 112, second paragraph, as being indefinite, due to the inclusion of the terms “Argon Fluoride” or “Fluoride.” Although Applicant does not necessarily agree, Applicant has without prejudice cancelled these claims, such that these rejections are now moot.

Claim rejections under 35 USC 103

Claims 1-15 have been rejected under 35 USC 103(a) as being unpatentable over Niu (6,433,878) in view of McKee (5,804,088). After the cancellation of claims 2-3, 5-7, and 13-14, claims 1, 4, 8-12, and 15 remain pending. Of these pending claims, claims 1 and 11 are independent claims. Applicant has amended claims 1 and 11 to better reflect and clarify the subject invention of the patent application, and respectfully traverses this rejection as to these amended claims. Because the other remaining pending claims ultimately depend from either claim 1 or claim 11, for at least the same reasons that claims 1 and 11 are patentable, the other remaining pending claims are, too.

Applicant makes two primary and independent arguments for patentability. First, that Niu in view of McKee does not teach or disclose all the limitations of the invention of claims 1 and 11. Second, that Niu is not combinable with McKee in the first instance, such that a *prima facie* case of obviousness has not been made. Applicant now discusses each of these independent arguments for patentability in detail.

Niu in view of McKee does not teach or disclose the claimed invention

As an initial point, Applicant believes that the Examiner seems to have interpreted the claimed invention of claims 1 and 11 as essentially pre-shrinking the photoresist layer via some type of plasma treatment, so that subsequent critical dimension measurement by using an electron beam does not itself result in critical dimension shrinkage. Although Applicant can see where the Examiner is coming from in this regard (although Applicant does not necessarily agree with the Examiner's interpretation), Applicant has amended the claims so that this interpretation of the claims can no longer be made. Applicant notes that both claims 1 and 11 have been amended so that the photoresist layer is subjected to plasma *curing*, not another type of plasma treating, such as plasma *etching*. While Applicant understands that the Examiner may be suspicious as to how plasma curing is that different from plasma etching, Applicant requests the Examiner's time, patience, and attention in reading the paragraphs that follow, as Applicant submits that this difference is indeed patentably distinct.

First, however, Applicant notes that the intent of the invention is not to pre-shrink the photoresist layer, so that subjecting the photoresist layer to an electron beam does not later shrink the photoresist layer. Rather, the intent of the invention is to substantially prevent or reduce shrinkage of the photoresist layer, period. That is, the intent of the invention is not to shift shrinkage of the photoresist (and thus the critical dimensions defined thereon) from the electron beam process to the plasma process, but rather to do *something* to prevent or reduce shrinkage of the photoresist *overall*. (Indeed, shifting shrinkage from one process, e-beam, to another process, plasma, does not provide much of an advantage at all, and is not much of an invention!) In this regard, Applicant submits that the difference between plasma *curing* and plasma *etching* is significant.

Applicant notes that plasma *curing* and plasma *etching* are both types of plasma *treatments*. As noted in the second paragraph of the detailed description of the patent application as filed, "[t]he plasma treatment may be a plasma etching, a high-density plasma etching, a plasma curing, and/or another type of plasma process." That is, the plasma treatment may be a

plasma etching and/or a plasma curing, indicating that plasma etching is not the same as plasma curing. Common dictionary definitions, as found at the Internet web site www.dictionary.com, also support this distinction or difference between etching and curing. One relevant definition of cure at www.dictionary.com is “[t]he act or process of preserving a product.” This makes sense and is consistent with how curing is being used in the claimed invention – the idea is to *preserve* the photoresist layer, via plasma curing, so that the photoresist layer is not subsequently shrunk during electron beam measurement. By comparison, one relevant definition of etch at www.dictionary.com is “[t]o cut into the surface of . . . by the action of acid.” This also makes sense and is consistent with how curing is not etching in the claimed invention – the idea is not to cut into the surface of the photoresist by the action of the plasma, as that would (pre-)shrink the photoresist, which is not desired. Therefore, there is a difference between plasma *curing* and plasma *etching*.

Niu in view of McKee, provided that they are indeed combinable, does not teach plasma *curing* before performing electron beam critical dimension measurement, however. Rather, Niu in view of McKee teaches plasma *etching* before performing electron beam critical dimension measurement. In particular, McKee, as indicated in the abstract thereof, teaches using isotropic or partially isotropic etching (i.e., plasma etching). Such plasma *etching* may shrink the photoresist layer, as, indeed, that is the purpose of etching, to etch away, or reduce or shrink. However, Niu in view of McKee do *not* teach plasma *curing*, in which the photoresist layer is subjected to plasma *without etching*, as to which claims 1 and 11 are inherently limited via their recitation of *curing* and not *etching*. The Examiner suggests in the Office Action that in a conventional process “using plasma treatment shrinks the photoresist.” However, Applicant respectfully asserts that shrinking the photoresist is only a result of using a plasma *etching*-type treatment, not a plasma *curing*-type treatment, and this is an important distinction.

The plasma *curing* of the claimed invention accomplishes, as described in the second paragraph of the detailed description and as specifically delineated in dependent claim 4, “increase[ing] the ion dosage in the photoresist, increasing the resistance of the resist to

shrinkage during subsequent e-beam measurement.” While plasma *etching* also can increase the ion dosage in the photoresist to increase the shrinkage resistance of the resist, plasma *etching* also pre-shrinks the photoresist, as the Examiner has noted, thus basically counteracting any type of shrinkage resistance it may impart. But the claimed invention’s plasma *curing* is not *etching*, and thus does not shrink (or etch) the photoresist—since (1) *curing* is inherently not *etching*; (2) *curing* does not cause shrinkage as *etching* does, since *etching* is different than *curing*; and, (3) *curing* is very different than *etching*, as supported by common dictionary definitions of the two words. That is, the idea here is to impart the benefits of plasma treatment without going so far as to actually *etch* the photoresist. Plasma *curing* accomplishes this, because it increases the ion dosage within the resist, without actually *etching* the photoresist.

Therefore, Niu in view of McKee does not render the invention of amended claims 1 and 11 non-obvious. Niu in view of McKee teaches plasma *etching*, whereas the claimed invention is limited to plasma *curing*. Plasma *curing*, however, is not the same as plasma *etching*. As a result, claims 1 and 11, and the remaining pending claims that ultimately depend therefrom, are patentable.

Niu is not combinable with McKee

Applicant also asserts as a separate and independent basis of patentability of claims 1 and 11, and the claims that depend therefrom, that Niu is not combinable with McKee, such that a *prima facie* case of non-obvious cannot be made. In particular, there is no motivation to combine Niu with McKee. Niu, by its usage of electron beam measurement, implicitly causes critical dimension photoresist shrinkage. McKee, by its usage of plasma etching, explicitly causes photoresist shrinkage. Combining Niu with McKee would result in photoresist shrinkage occurring during plasma etching, instead of during electron beam measurement. That is, combining Niu with McKee does not substantially prevent photoresist shrinkage, but rather just shifts shrinkage from the electron beam measurement process to the plasma etching process. In

effect, performing plasma etching before electron beam measurement “pre-shrinks” the photoresist, so that the photoresist is not then shrunk during electron beam measurement.

However, there is no motivation to add the extra complexity, expense, and time involved in plasma etching before conducting electron beam measurement. That is, if the end result is the same—photoresist-and-critical-dimension-shrinkage—why-shift-the-shrinkage-from-the-electron-beam measurement process to the plasma etching process? There is definitely no implicit motivation to do so, and Applicant cannot find (and the Examiner has not proffered) an explicit motivation to do so. As can be appreciated by those of ordinary skill within the art and by the Examiner, plasma etching typically requires a different set of semiconductor processing equipment, such as a wholly different chamber in which the plasma etching is accomplished, as compared to electron beam measurement. If no extra benefits result from combining the plasma etching of McKee with the electron beam measurement of Niu – viz., since the end result of plasma etching plus electron beam measurement, photoresist shrinkage, is the same as the end result of electron beam measurement by itself – then there is decidedly no motivation to do plasma etching before e-beam measurement, and thus no motivation to combine Niu and McKee.

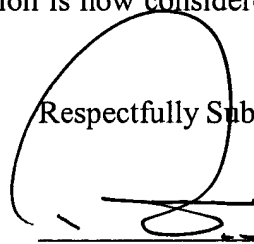
Indeed, there is a disincentive to combining Niu with McKee, such that, if anything, Niu implicitly teaches away from being combined with McKee. Since Niu already results in photoresist and critical dimension shrinkage, one of ordinary skill in the art would not be motivated to add the extra complexity, expense, and time involved in also doing the plasma etching of McKee to cause the same result, photoresist and critical dimension shrinkage. However, because *there is* added complexity, expense, and time involved in performing plasma etching before electron beam measurement, without any added benefit in also performing plasma etching as opposed to just performing electron beam measurement – viz., the result is the same as to shrinkage whether or not plasma etching is performed – the added complexity, expense, and time involved in also performing plasma etching teaches away from combining Niu with McKee.

Therefore, Niu is not combinable with McKee. The added complexity, expense, and time involved in adding the plasma etching of McKee as a process performed before the electron beam measurement of Niu confers no benefit to McKee, and only (pre-)shifts shrinkage of the photoresist and critical dimensions defined thereon from electron beam measurement to plasma etching. Thus, there is no motivation to combine Niu with McKee. Further, the added complexity, expense, and time involved in adding the plasma etching of McKee as a process performed before the electron beam measurement of Niu, with no discerning benefit or advantage in doing so, serves to teach away from, or provide as a disincentive or de-motivation to, combining McKee and Niu. As a result, claims 1 and 11, and the remaining pending claims that ultimately depend therefrom, cannot be rendered obvious over Niu in view of McKee, and thus are patentable.

Conclusion

Applicant has made a diligent effort to place the pending claims in condition for allowance, and request that they so be allowed. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Randy Tung, Applicant's Attorney, at 248-540-4040, so that such issues may be resolved as expeditiously as possible. For these reasons, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,



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